

JEDEC SOLID STATE  
PRODUCT OUTLINE  
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THIS **REGISTERED OUTLINE** HAS BEEN PREPARED BY THE JEDEC JC-11 COMMITTEE  
AND REFLECTS A PRODUCT WITH ANTICIPATED USAGE IN THE ELECTRONICS INDUSTRY;  
CHANGES ARE LIKELY TO OCCUR.

TITLE SQUARE & RECTANGULAR  
DIE-SIZE, BALL GRID  
ARRAY FAMILY

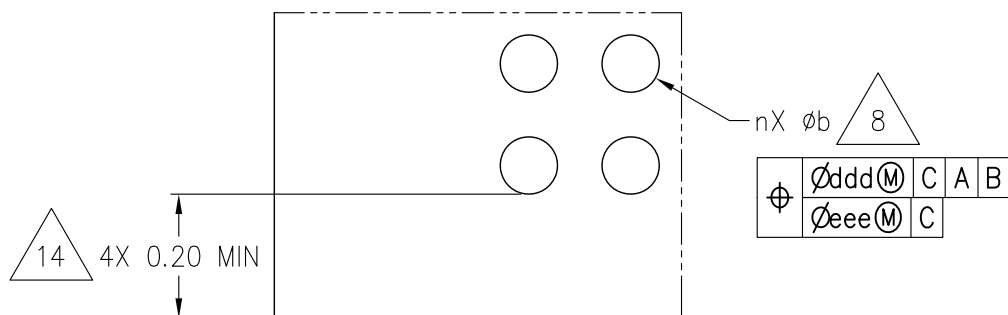
PACKAGE DESIGNATOR  
(L,T,V,W)  
F (R)-xDSB

NUMBER  
**MO-207**

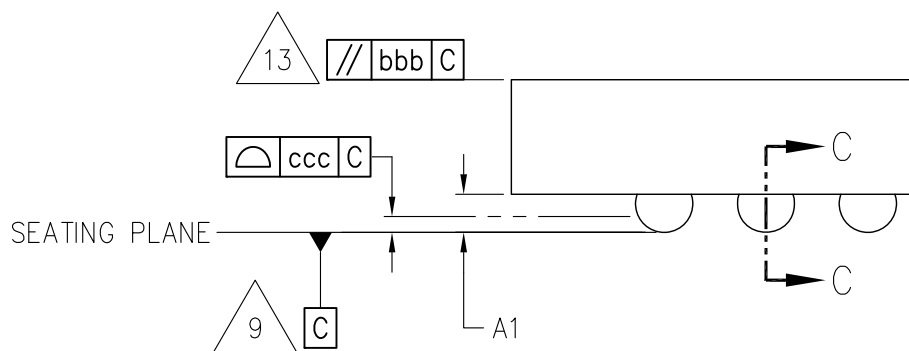
ISSUE  
**N**

DATE  
JUN 2013

SHEET  
1 OF 24

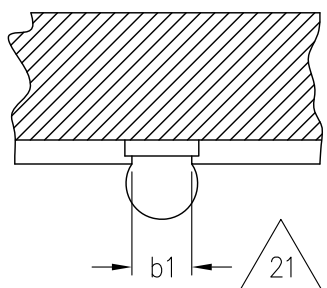


DETAIL A

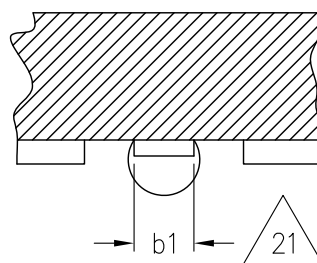


DETAIL B  
(ROTATED 90° CW)

TYPE 1 – SMD  
(SOLDER MASK DEFINED)



TYPE 2 – NSMD  
(NON SOLDER MASK DEFINED)



SECTION C-C

TABLE 1

16

TOLERANCE OF FORM AND POSITION					
VARIATION	Ayy-zs	Byy-zs	Cyy-zs	Dyy-zs	NOTES
SYMBOL					
e	0.75 BASIC	0.65 BASIC	0.50 BASIC	0.80 BASIC	4
aaa	0.15	0.15	0.15	0.15	
bbb	0.20	0.20	0.20	0.20	13
ddd	0.15	0.15	0.15	0.15	
eee	0.08	0.08	0.05	0.08	
NOTES	1, 2, 18	1, 2, 18	1, 2, 18	1, 2, 18	
REF	11-846	11-846	11-846	11-846	
ISSUE	N	N	N	N	

FIRST DIGIT IS BALL PITCH (MM): A=0.75, B=0.65, C=0.50, D=0.80

yy = A, B, C...AA, AB, AC...FOR THE VARIOUS BODY/MATRIX SIZE COMBINATIONS (MAY BE 1 OR 2 CHARACTERS). EACH SET OF PITCH VARIATIONS IS INDEPENDENT.

z = PROFILE HEIGHT OPTIONS:

1 = 1.70 MM MAXIMUM (STANDARD PROFILE)

2 = 1.20 MM MAXIMUM (THIN PROFILE)

3 = 1.00 MM MAXIMUM (VERY THIN PROFILE)

4 = 0.80 MM MAXIMUM (VERY VERY THIN PROFILE)

s = a, b, etc. OPTIONAL CHARACTER FOR SPECIAL FEATURES

TABLE 2

16

PROFILE DIMENSIONS – LOW										
VARIATION	Ayy–1			Byy–1			Cyy–1			NOTES
SYMBOL	MIN	NOM	MAX	MIN	NOM	MAX	MIN	NOM	MAX	
A	–	–	1.70	–	–	1.70	–	–	1.70	7, 14
A1	0.25	–	–	0.20	–	–	0.15	–	–	
A2	0.60	–	–	0.60	–	–	0.60	–	–	
b	0.40	0.45	0.50	0.35	0.40	0.45	0.25	0.30	0.35	8
b1	0.30	–	–	0.25	–	–	0.20	–	–	
e	0.75 BASIC			0.65 BASIC			0.50 BASIC			4
	TOLERANCE OF FORM AND POSITION									
ccc	0.12			0.10			0.08			
NOTES	1, 2, 18			1, 2, 18			1, 2, 18			
REF	04–628			11–846			04–628			
ISSUE	G			N			G			

TABLE 2 CONTINUED

PROFILE DIMENSIONS – LOW										
VARIATION	Dyy–1			–			–			NOTES
SYMBOL	MIN	NOM	MAX	MIN	NOM	MAX	MIN	NOM	MAX	
A	–	–	1.70	–	–	–	–	–	–	7, 14
A1	0.25	–	–	–	–	–	–	–	–	
A2	0.60	–	–	–	–	–	–	–	–	
b	0.40	0.45	0.50	–	–	–	–	–	–	8
b1	0.30	–	–	–	–	–	–	–	–	
e	0.80 BASIC			–			–			4
	TOLERANCE OF FORM AND POSITION									
ccc	0.12			–			–			
NOTES	1, 2, 18			–			–			
REF	04–703			–			–			
ISSUE	J			–			–			

TABLE 3

16

PROFILE DIMENSIONS – THIN										
VARIATION	Ayy–2			Ayy–2a			Byy–2			NOTES
SYMBOL	MIN	NOM	MAX	MIN	NOM	MAX	MIN	NOM	MAX	
A	–	–	1.20	–	–	1.20	–	–	1.20	7, 14
A1	0.25	–	–	0.18	–	–	0.20	–	–	
A2	0.60	–	–	0.60	–	–	0.60	–	–	
b	0.40	0.45	0.50	0.30	0.35	0.40	0.35	0.40	0.45	8
b1	0.30	–	–	0.25	–	–	0.30	–	–	
e	0.75 BASIC			0.75 BASIC			0.65 BASIC			4
	TOLERANCE OF FORM AND POSITION									
ccc	0.12			0.10			0.10			
NOTES	1, 2, 18			1, 2, 18			1, 2, 18			
REF	11–846			11–846			11–846			
ISSUE	N			N			N			

TABLE 3 CONTINUED

PROFILE DIMENSIONS – THIN										
VARIATION	Cyy–2			Dyy–2			–			NOTES
SYMBOL	MIN	NOM	MAX	MIN	NOM	MAX	MIN	NOM	MAX	
A	–	–	1.20	–	–	1.20	–	–	–	7, 14
A1	0.15	–	–	0.25	–	–	–	–	–	
A2	0.60	–	–	0.60	–	–	–	–	–	
b	0.25	0.30	.035	0.40	0.45	0.50	–	–	–	8
b1	0.20	–	–	0.30	–	–	–	–	–	
e	0.50 BASIC			0.80 BASIC			–			4
	TOLERANCE OF FORM AND POSITION									
ccc	0.08			0.12			–			
NOTES	1, 2, 18			1, 2, 18, 22			–			
REF	11–846			11–846			–			
ISSUE	N			N			–			

TABLE 4

16

PROFILE DIMENSIONS – VERY THIN										
VARIATION	Ayy–3			Ayy–3a			Ayy–3b			NOTES
SYMBOL	MIN	NOM	MAX	MIN	NOM	MAX	MIN	NOM	MAX	
A	–	–	1.00	–	–	1.00	–	–	1.00	7, 14
A1	0.15	–	–	0.25	–	–	0.15	–	–	
A2	–	–	0.80	–	–	0.70	–	–	0.80	
b	0.25	0.30	0.35	0.40	0.45	0.50	0.30	0.35	0.40	8
b1	0.20	–	–	0.30	–	–	0.25	–	–	
e	0.75 BASIC			0.75 BASIC			0.75 BASIC			4
	TOLERANCE OF FORM AND POSITION									
ccc	0.08			0.12			0.10			
NOTES	1, 2, 18			1, 2, 18			1, 2, 18			
REF	11–846			11–846			11–846			
ISSUE	N			N			N			

TABLE 4 CONTINUED

PROFILE DIMENSIONS – VERY THIN										
VARIATION	Byy–3			Cyy–3			Dyy–3			NOTES
SYMBOL	MIN	NOM	MAX	MIN	NOM	MAX	MIN	NOM	MAX	
A	–	–	1.00	–	–	1.00	–	–	1.00	7, 14
A1	0.15	–	–	0.15	–	–	0.25	–	–	
A2	–	–	0.80	–	–	0.80	–	–	0.70	
b	0.25	0.30	.035	0.25	0.30	0.35	0.40	0.45	0.50	8
b1	0.20	–	–	0.20	–	–	0.30	–	–	
e	0.65 BASIC			0.50 BASIC			0.80 BASIC			4
	TOLERANCE OF FORM AND POSITION									
ccc	0.08			0.08			0.12			
NOTES	1, 2, 18			1, 2, 18			1, 2, 18			
REF	11–846			11–846			11–846			
ISSUE	N			N			N			

TABLE 5

16

PROFILE DIMENSIONS – VERY VERY THIN										
VARIATION	Cyy–4			–			–			NOTES
SYMBOL	MIN	NOM	MAX	MIN	NOM	MAX	MIN	NOM	MAX	
A	–	–	0.80	–	–	–	–	–	–	7, 14
A1	0.15	–	–	–	–	–	–	–	–	
A2	–	–	0.60	–	–	–	–	–	–	
b	0.25	0.30	0.35	–	–	–	–	–	–	8
b1	0.20	–	–	–	–	–	–	–	–	
e	0.50 BASIC			–			–			4
	TOLERANCE OF FORM AND POSITION									
ccc	0.08			–			–			
NOTES	1, 2, 18			–			–			
REF	11–846			–			–			
ISSUE	N			–			–			

TABLE 6

VARIATIONS – 0.50 PITCH														
VARIATION	D MAX	E MAX	D1 BASIC	E1 BASIC	MD	ME	SD BASIC	SE BASIC	n	N	FOOT PRINT	REF	ISSUE	NOTES
CA-z	5.00	4.50	2.50	3.50	6	8	0.25	0.25	48	48	–	11-494	A	
CB-z	6.00	4.00	5.00	2.50	11	6	0.00	0.25	48	66	17	04-683	I	
CC-z	6.00	4.00	4.00	2.50	9	6	0.00	0.25	34	54	18	04-683	I	
CD-z	12.00	12.00	8.00	8.00	17	17	0.00	0.00	253	289	26	11-846	–	25
NOTES					5	5	11	11	5, 12					
	1, 2, 16, 18													



TABLE 7

VARIATIONS – 0.65 PITCH														
VARIATION	D MAX	E MAX	D1 BASIC	E1 BASIC	MD	ME	SD BASIC	SE BASIC	n	N	FOOT PRINT	REF	ISSUE	NOTES
BA–z	6.00	5.50	4.55	2.60	8	5	0.325	0.00	40	40	–	11–494	A	
BB–z	7.50	6.50	4.55	1.95	8	4	0.325	0.325	32	32	–	11–494	A	
BC–z	10.00	5.00	4.55	3.25	8	6	0.325	0.325	48	48	–	11–494	A	
BD–z	10.00	6.00	4.55	3.25	8	6	0.325	0.325	48	48	–	11–494	A	
BE–z	11.00	7.50	4.55	3.25	8	6	0.325	0.325	48	48	–	11–494	A	
BG–z	11.50	10.00	10.40	5.85	17	10	0.00	0.325	134	170	25	11–846	–	24
BH–z	11.50	11.00	10.40	5.85	17	10	0.00	0.325	134	170	25	11–846	–	24
BJ–z	11.50	11.50	10.40	5.85	17	10	0.00	0.325	134	170	25	11–846	–	24
BK–z	11.50	13.00	10.40	5.85	17	10	0.00	0.325	134	170	25	11–846	–	24
BF–z	15.50	8.50	3.25	1.95	6	4	0.325	0.325	24	24	–	11–494	A	
NOTES					5	5	11	11						
	1, 2, 16, 18													

TABLE 8

VARIATIONS – 0.75 PITCH

VARIATION	D MAX	E MAX	D1 BASIC	E1 BASIC	MD	ME	SD BASIC	SE BASIC	n	N	FOOT PRINT	REF	ISSUE	NOTES
AA-z	6.00	5.50	5.25	3.00	8	5	0.375	0.00	40	40	–	11-494	A	
AW-3a	7.00	6.00	5.25	3.75	8	6	0.375	0.375	48	48	–	04-618	F	19
AAD-2a	7.00	8.00	3.75	5.25	6	8	0.375	0.375	46	48	5	04-618	F	
AB-z	7.50	6.50	5.25	2.25	8	4	0.375	0.375	32	32	–	11-494	A	
AC-z	8.00	6.00	5.25	3.00	8	5	0.375	0.00	40	40	–	11-494	A	
AC-3b	8.00	6.00	5.25	3.00	8	5	0.375	0.00	40	40	–	04-618	F	
AD-z	8.00	6.00	5.25	3.75	8	6	0.375	0.375	48	48	–	11-494	A	
AD-3a	8.00	6.00	5.25	3.75	8	6	0.375	0.375	48	48	–	04-618	F	19
AAM-3b	8.00	6.00	6.00	3.75	9	6	0.00	0.375	54	54	–	04-775	L	
AN-z	8.00	7.50	3.75	5.25	6	8	0.375	0.375	48	48	–	11-524	B	
AN-3b	8.00	7.50	3.75	5.25	6	8	0.375	0.375	48	48	–	04-618	F	
AAE-2a	8.50	7.00	3.75	5.25	6	8	0.375	0.375	47	48	6	04-618	F	
AY-3a	9.00	7.00	5.25	3.75	8	6	0.375	0.375	48	48	–	04-618	F	19
AE-z	9.00	8.50	5.25	3.75	8	6	0.375	0.375	48	48	–	11-494	A	
AF-z	10.00	6.00	5.25	3.75	8	6	0.375	0.375	48	48	–	11-494	A	
AAF-2a	10.00	7.00	3.75	5.25	6	8	0.375	0.375	48	48	–	04-618	F	
AAG-2a	10.00	7.00	7.50	5.25	11	8	0.00	0.375	58	88	7	04-775	L	
AG-z	10.00	8.00	3.00	5.25	5	8	0.00	0.375	40	40	–	11-494	A	
AG-3b	10.00	8.00	3.00	5.25	5	8	0.00	0.375	40	40	–	04-618	F	
AH-z	10.00	8.00	3.75	5.25	6	8	0.375	0.375	48	48	–	11-494	A	
NOTES	1, 2, 16, 18													
					5	5	11	11	5, 12					

TABLE 8 CONTINUED

VARIATIONS – 0.75 PITCH														
VARIATION	D MAX	E MAX	D1 BASIC	E1 BASIC	MD	ME	SD BASIC	SE BASIC	n	N	FOOT PRINT	REF	ISSUE	NOTES
AH-3b	10.00	8.00	3.75	5.25	6	8	0.375	0.375	48	48	–	04-618	F	
AAA-3a	10.00	8.00	5.25	3.75	8	6	0.375	0.375	48	48	–	04-618	F	19
AJ-z	10.00	8.00	5.25	5.25	8	8	0.375	0.375	64	64	–	11-494	A	
AAN-3b	10.00	8.00	6.00	3.75	9	6	0.00	0.375	54	54	–	04-775	L	
AT-z	11.50	7.00	9.00	3.75	13	6	0.00	0.375	52	78	2	04-532	C	
AU-z	11.50	11.00	9.00	3.75	13	6	0.00	0.375	52	78	2	04-532	C	
AAH-2a	12.00	7.00	3.75	5.25	6	8	0.375	0.375	48	48	–	04-618	F	
AAJ-2a	12.00	7.00	7.50	5.25	11	8	0.00	0.375	58	88	7	04-618	F	
AAK-2a	12.00	8.00	3.75	5.25	6	8	0.375	0.375	48	48	–	04-618	F	
AAB-3a	12.00	8.00	5.25	3.75	8	6	0.375	0.375	48	48	–	04-618	F	19
AAL-2a	12.00	8.00	7.50	5.25	11	8	0.00	0.375	59	88	8	04-618	F	
AAC-3a	12.00	9.00	5.25	3.75	8	6	0.375	0.375	48	48	–	04-618	F	19
AK-z	12.50	6.00	5.25	3.75	8	6	0.375	0.375	48	48	–	11-494	A	
AP-z	13.00	7.50	3.75	5.25	6	8	0.375	0.375	48	48	–	11-524	B	
AP-3b	13.00	7.50	3.75	5.25	6	8	0.375	0.375	48	48	–	04-618	F	
AV-z	14.00	8.00	7.50	5.25	11	8	0.00	0.375	60	88	4	04-570	D	
AV-3b	14.00	8.00	7.50	5.25	11	8	0.00	0.375	60	88	4	04-618	F	
AR-z	14.50	8.00	7.50	3.75	11	6	0.00	0.375	44	66	1	04-532	C	
AL-z	15.50	8.50	3.75	2.25	6	4	0.375	0.375	24	24	–	11-494	A	
AM-z	17.00	10.00	5.25	5.25	8	8	0.375	0.375	64	64	–	11-494	A	
NOTES					5	5	11	11	5, 12					
	1, 2, 16, 18													

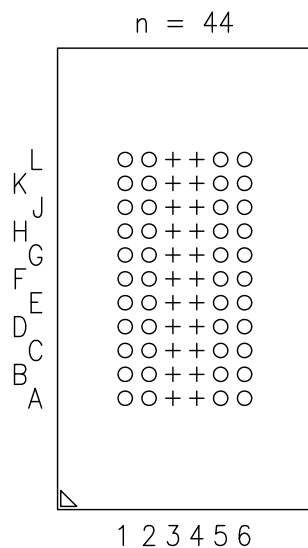
TABLE 9

## VARIATIONS – 0.80 PITCH

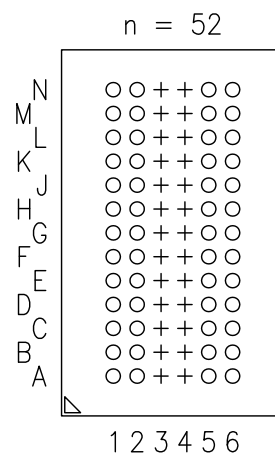
VARIATION	D MAX	E MAX	D1 BASIC	E1 BASIC	MD	ME	SD BASIC	SE BASIC	n	N	FOOT PRINT	REF	ISSUE	NOTES
DN-z	8.00	6.00	5.60	4.00	8	6	0.40	0.40	48	48	–	04-683	I	
DC-z	8.00	8.00	6.40	6.40	9	9	0.00	0.00	54	81	3	04-624	F	
DD-z	9.00	8.00	6.40	6.40	9	9	0.00	0.00	54	81	3	04-624	F	
DA-z	9.00	8.50	6.40	6.40	9	9	0.00	0.00	54	81	3	04-605	E	
DP-z	10.00	8.00	5.60	4.00	8	6	0.40	0.40	48	48	–	04-683	I	
DH-z	11.00	9.00	8.80	7.20	12	10	0.40	0.40	63	120	10	04-628	G	
DQ-z	11.00	10.50	7.20	6.40	10	9	0.40	0.00	60	90	15	04-683	I	
DE-z	12.00	8.00	6.40	6.40	9	9	0.00	0.00	54	81	3	04-624	F	
DF-z	12.00	8.00	9.60	6.40	13	9	0.00	0.00	58	117	9	04-624	F	
DG-z	14.00	8.00	6.40	6.40	9	9	0.00	0.00	54	81	3	04-624	F	
DV-z	14.00	11.00	11.20	7.20	15	10	0.00	0.40	137	150	21	04-703	J	
DAA-z	14.00	12.00	12.80	10.40	17	14	0.00	0.40	170	238	24	04-775	L	22
DR-z	14.00	14.00	12.80	8.80	17	12	0.00	0.40	136	204	16	04-683	I	22
DJ-z	15.00	12.50	8.00	6.40	11	9	0.00	0.00	60	99	11	04-628	G	20
DAB-z	15.00	14.00	12.80	8.80	17	12	0.00	0.40	136	204	16	04-840	M	23
DB-z	15.50	8.50	6.40	6.40	9	9	0.00	0.00	54	81	3	04-605	E	
DT-z	17.00	12.50	9.60	6.40	13	9	0.00	0.00	78	117	19	04-703	J	20
DK-z	18.00	12.50	11.20	6.40	15	9	0.00	0.00	84	135	12	04-628	G	20
DU-z	19.00	12.50	12.00	6.40	16	9	0.40	0.00	96	144	20	04-703	J	20
NOTES	1, 2, 16, 18													

TABLE 9 CONTINUED

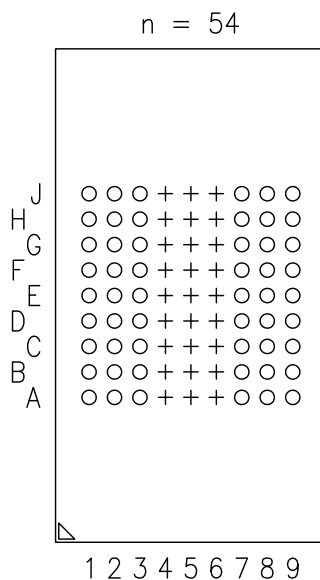
VARIATIONS – 0.80 PITCH														
VARIATION	D MAX	E MAX	D1 BASIC	E1 BASIC	MD	ME	SD BASIC	SE BASIC	n	N	FOOT PRINT	REF	ISSUE	NOTES
DM–z	21.00	12.50	14.40	6.40	19	9	0.00	0.00	68	171	14	04–628	G	20
DL–z	21.00	12.50	16.00	6.40	21	9	0.00	0.00	92	189	13	04–628	G	20
DW–z	22.00	12.50	17.60	8.00	23	11	0.00	0.00	106	253	22	04–775	L	20
DY–z	22.00	12.50	16.80	8.00	22	11	0.40	0.00	112	242	23	04–775	L	20
NOTES					5	5	11	11	5, 12					
	1, 2, 16, 18													



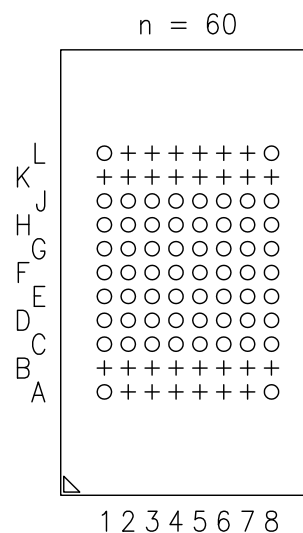
FOOTPRINT 1



FOOTPRINT 2



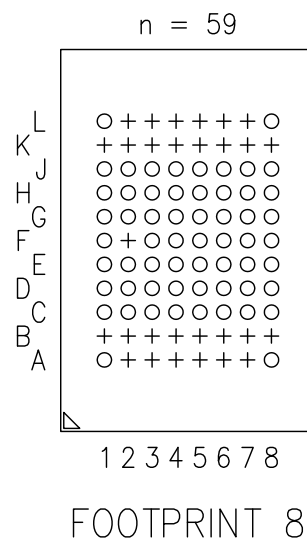
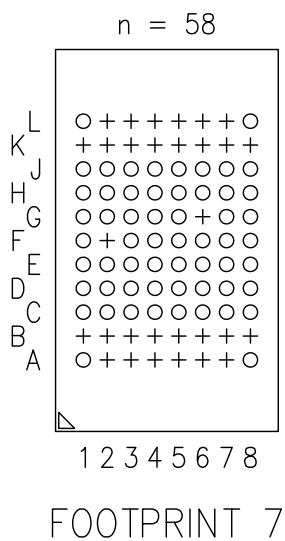
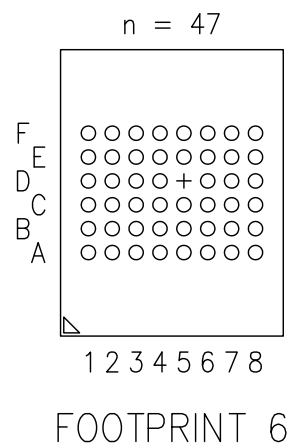
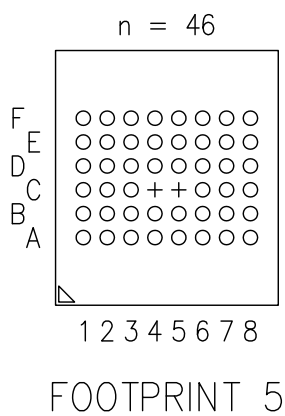
FOOTPRINT 3



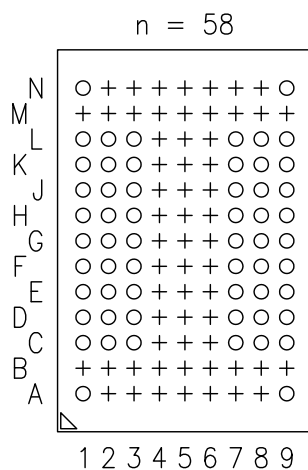
FOOTPRINT 4



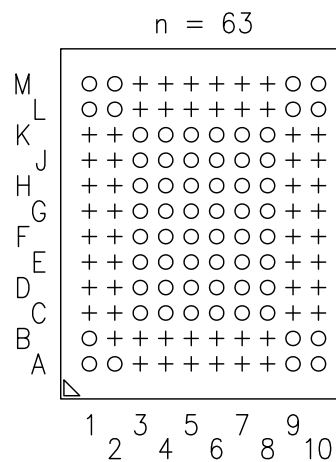
+ = DEPOPULATED BALL POSITIONS



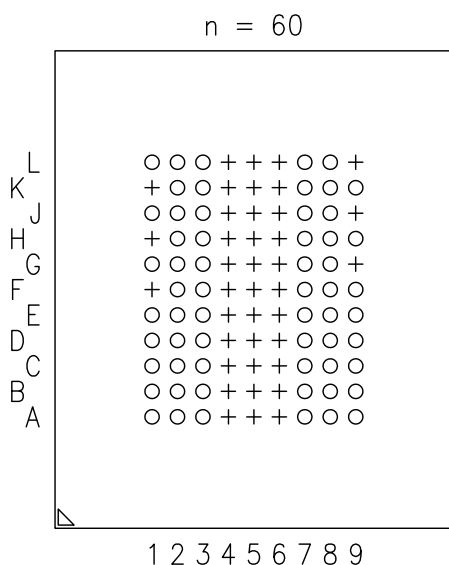
+ = DEPOPULATED BALL POSITIONS



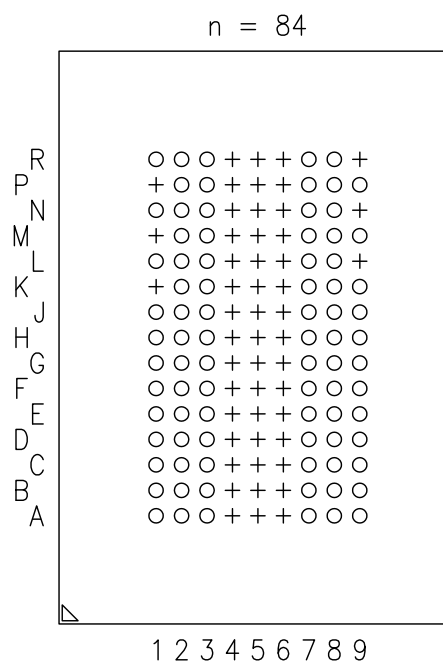
FOOTPRINT 9



FOOTPRINT 10



FOOTPRINT 11

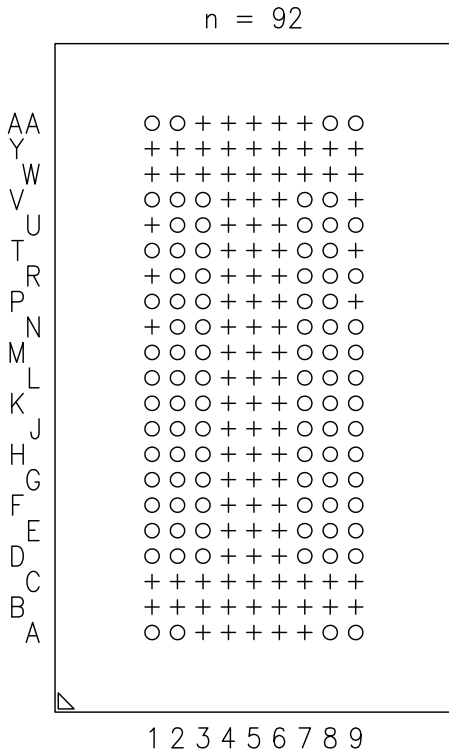


FOOTPRINT 12

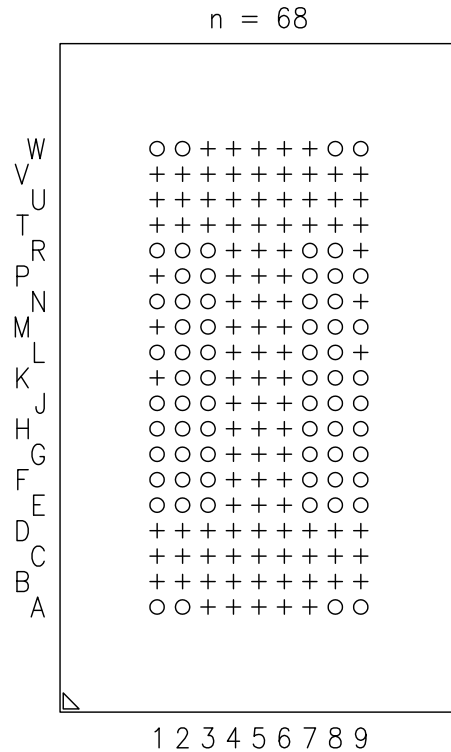


+ = DEPOPULATED BALL POSITIONS

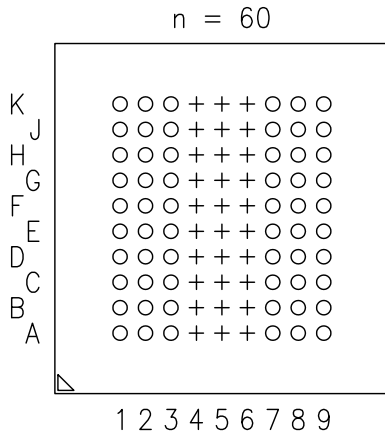




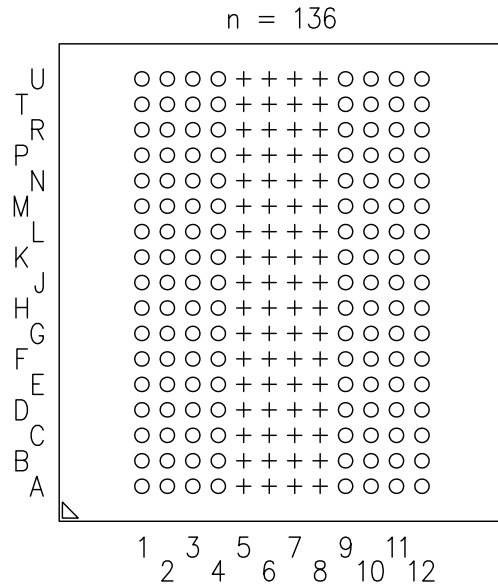
FOOTPRINT 13



FOOTPRINT 14



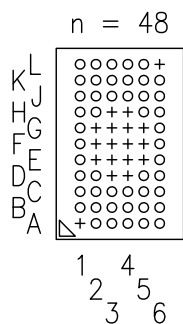
FOOTPRINT 15



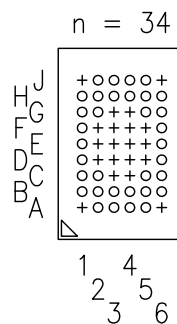
FOOTPRINT 16



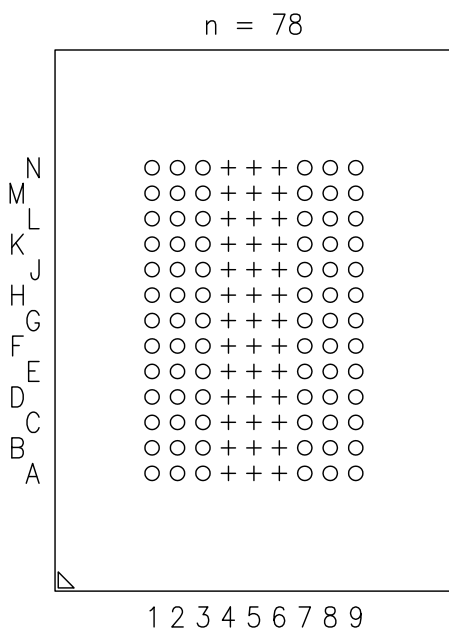
+ = DEPOPULATED BALL POSITIONS



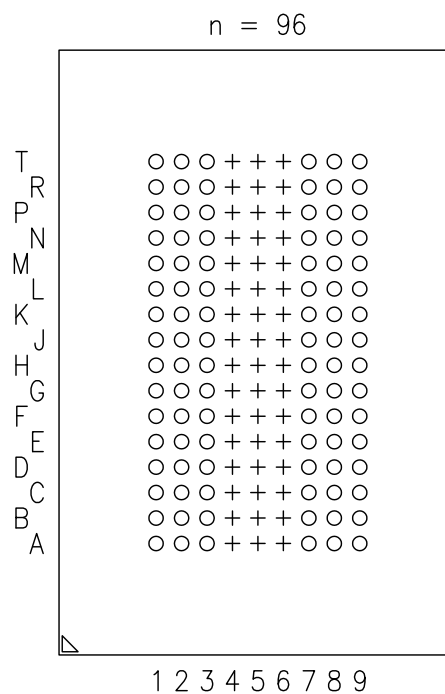
FOOTPRINT 17



FOOTPRINT 18



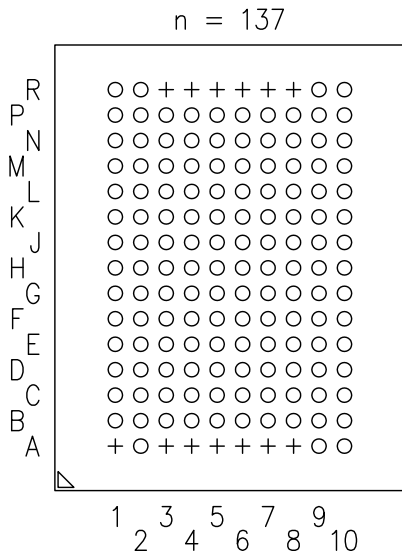
FOOTPRINT 19



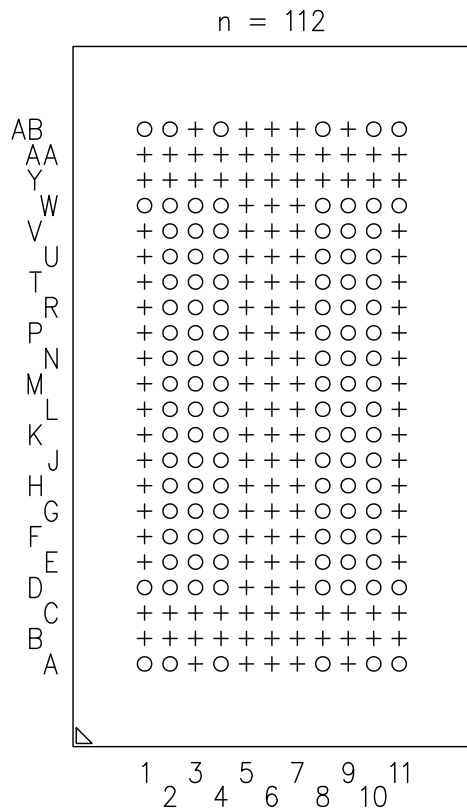
FOOTPRINT 20



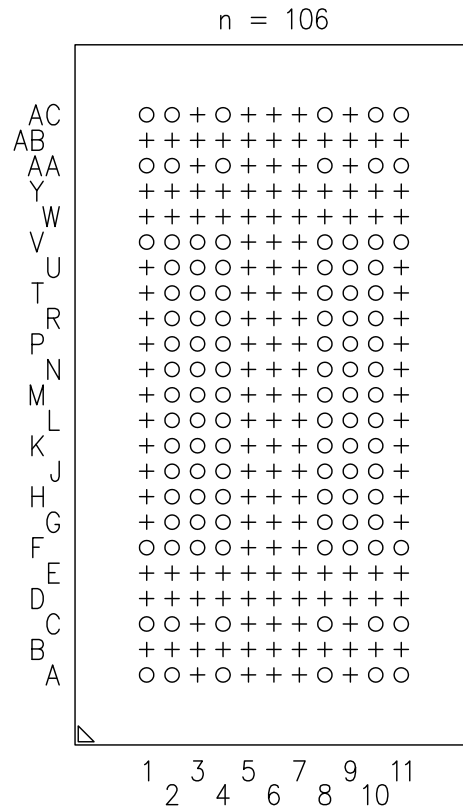
+ = DEPOPULATED BALL POSITIONS



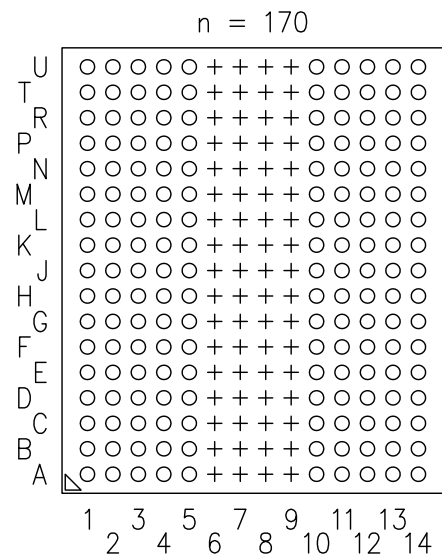
FOOTPRINT 21



FOOTPRINT 23



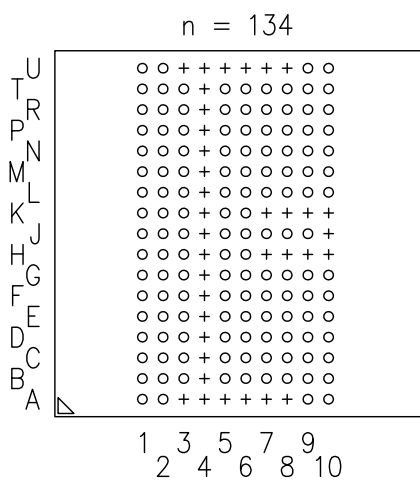
FOOTPRINT 22



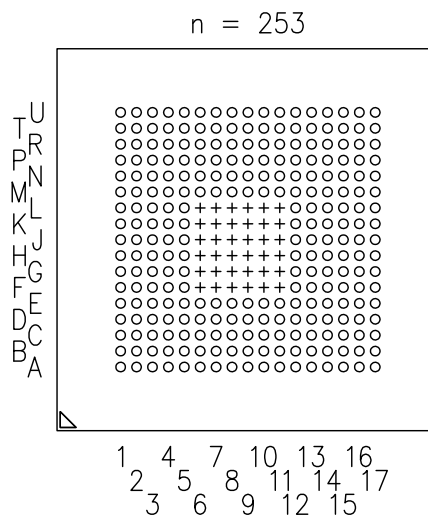
FOOTPRINT 24



+ = DEPOPULATED BALL POSITIONS



FOOTPRINT 25



FOOTPRINT 26



+ = DEPOPULATED BALL POSITIONS

# NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5–2009.  
THIS OUTLINE CONFORMS TO JEP95, SECTION 4.6.

2. ALL DIMENSIONS ARE IN MILLIMETERS.



SOLDER BALL POSITION DESIGNATION PER JEP95, SECT. 3, SPP–010 (SQUARE PACKAGES)  
AND SPP–020 (RECTANGULAR PACKAGES).

4. "e" REPRESENTS THE SOLDER BALL GRID PITCH.

5. SYMBOL "MD" IS THE BALL MATRIX SIZE IN THE "D" DIRECTION.  
SYMBOL "ME" IS THE BALL MATRIX SIZE IN THE "E" DIRECTION.  
n IS THE ACTUAL NUMBER OF BALLS FOR MATRIX SIZE MD x ME AND DOES NOT INCLUDE  
BALLS FROM ANY DEPOPULATED LOCATIONS.  
N REPRESENTS THE MAXIMUM NUMBER OF SOLDER BALLS FOR A FULL MATRIX, MD X ME.



6 X 8 MATRIX IS SHOWN FOR ILLUSTRATION ONLY.



THIS DIMENSION INCLUDES STAND–OFF HEIGHT "A1", AND PACKAGE BODY THICKNESS,  
BUT DOES NOT INCLUDE ATTACHED FEATURES, e.g., EXTERNAL HEATSINK OR  
CHIP CAPACITORS. AN INTEGRAL HEATSLUG IS NOT CONSIDERED AN ATTACHED FEATURE.



DIMENSION "b" IS MEASURED AT THE MAXIMUM SOLDER BALL DIAMETER IN A PLANE  
PARALLEL TO DATUM C.



PRIMARY DATUM C (SEATING PLANE) IS DEFINED BY THE CROWNS OF THE SOLDER BALLS.



TERMINAL A1 CORNER MUST BE IDENTIFIED ON THE TOP SURFACE BY CHAMFER, INK MARK,  
METALLIZED MARKINGS, INDENTATION, OR OTHER MEANS ON THE PACKAGE BODY, LID OR  
INTEGRAL HEATSLUG. SOME ORIENTATION FEATURE ON THE BALL ATTACH SIDE IS RECOMMENDED.



SD AND SE ARE MEASURED WITH RESPECT TO DATUMS A AND B AND DEFINE THE  
POSITION OF THE CENTER SOLDER BALL IN THE OUTER ROW. WHEN THERE IS AN ODD  
NUMBER OF SOLDER BALLS IN THE OUTER ROW PARALLEL TO THE D OR E DIMENSION,  
RESPECTIVELY, SD OR SE = 0.0 BSC. WHEN THERE IS AN EVEN NUMBER OF SOLDER BALLS  
IN THE OUTER ROW, SD OR SE =  $e/2$  BASIC.



SOLDER BALL ARRAY MAY BE DEPOPULATED BY OMISSION OF BALLS FROM A FULL  
MD x ME MATRIX.



PARALLELISM ON THE TOP SURFACE (bbb) APPLIES ONLY TO THE 3.0mm x 5.0mm MINIMUM  
FLAT AREA SHOWN ON THE TOP VIEW (SHEET 1). THIS AREA MAY BE USED FOR  
MARKING OR VACUUM PICKUP.



THIS IS A CONTROLLING DIMENSION.

15. MAXIMUM BODY SIZES (D AND E) ARE DERIVED FROM ACTUAL BODY SIZES ROUNDED TO THE NEXT HIGHEST 0.50 MM INCREMENT (X.00 OR X.50). ACTUAL VALUES FOR D AND E MUST BE OBTAINED FROM PACKAGE PRODUCER.



VARIATION CODING FORM IS  $xyy-zs$ , WHERE:

$x = A, B, C$  OR  $D$  FOR VARIOUS BALL PITCHES

(0.75mm, 0.65mm, 0.50mm OR 0.80mm RESPECTIVELY).

$yy = A, B, C \dots AA, AB, AC \dots$  FOR THE VARIOUS BODY/MATRIX SIZE COMBINATIONS (MAY BE 1 OR 2 CHARACTERS). EACH SET OF PITCH VARIATIONS IS INDEPENDENT.

$z = 1, 2, \text{etc}, \dots$  FOR PROFILE HEIGHTS OPTIONS.

$s = a, b, \text{etc}, \dots$  FOR SPECIAL FEATURES (OPTIONAL CHARACTER).



FOR BOARD LAYOUT USER MUST OBTAIN CORRECT TERMINAL A1 CORNER ORIENTATION FROM DEVICE SUPPLIER.

18. THESE PACKAGES ARE USED PRINCIPALLY FOR MEMORY DEVICES.

19. THE  $xyy$  CALL OUT ON THESE VARIATIONS WERE REVISED.  
HERE IS A CROSS-REFERENCE OF THE OLD CALL OUT AND THE NEW CALL OUT:

OLD			NEW		
VARIATION	REF	ISSUE	VARIATION	REF	ISSUE
AA-3a	04-605	E	AW-3a	04-618	F
AB-3a	04-605	E	AD-3a	04-618	F
AC-3a	04-605	E	AY-3a	04-618	F
AD-3a	04-605	E	AAA-3a	04-618	F
AE-3a	04-605	E	AAB-3a	04-618	F
AF-3a	04-605	E	AAC-3a	04-618	F



FOR DDR2 AND DDR3 MODULE APPLICATIONS REFER TO DETAIL F, PAGE 4 OF MO-237.  
E (MAX) DIMENSION MAY BE PRACTICALLY LIMITED.

ALSO FOR DDR3 MODULE APPLICATIONS, E (MAX) DIMENSION MAY BE PRACTICALLY LIMITED.

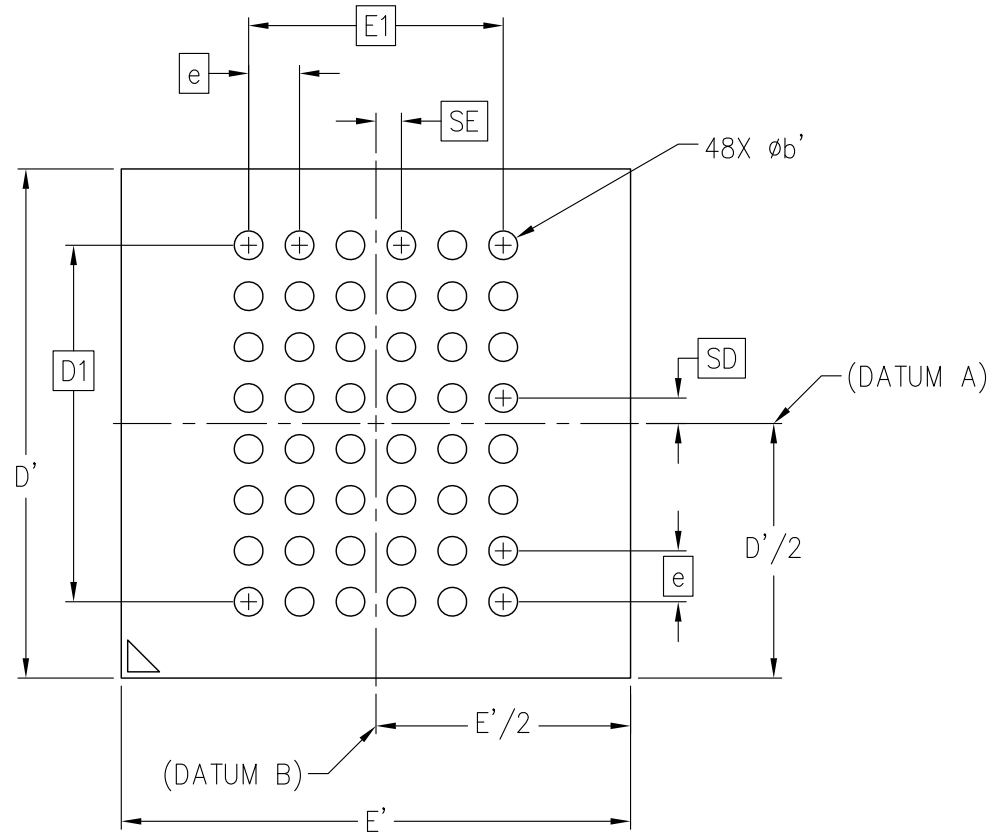


THE SOLDERABLE SURFACE MAY BE DEFINED BY AN OPENING IN THE SOLDER RESIST LAYER (TYPE 1 "SMD") OR BY THE SIZE OF A METALIZED PAD (TYPE 2 "NSMD"). IT MAY BE ELLIPTICAL PROVIDED THE RATIO OF THE MAJOR TO MINOR AXES IS NO GREATER THAN 2/1, AND THE SURFACE AREA IS NO LESS THAN THE MINIMUM FOR A CIRCULAR PAD. FOR TYPE 2 DESIGNS, EXPOSED COPPER TRACES ARE PERMITTED OUTSIDE THE b1 PAD AREA.

APPLICATION NOTES:

22. FOR GDDR4 AND GDDR5 APPLICATION, THERE ARE ADDITIONAL RESTRICTIONS ON PACKAGE HEIGHT TOLERANCE AND ON BALL STAND-OFF VALUES FOR MORE HARMONIZED GEOMETRICAL PROPERTIES ACROSS THE SUPPLIERS.  
THE VALUES ARE: A MIN = 1.00; A MAX = 1.20; A1 MIN = 0.30; A1 MAX = 0.40.
23. FOR DDR3 x32 MONO DEVICE CASE, ALSO THERE ARE ADDITIONAL RESTRICTIONS ON PACKAGE HEIGHT TOLERANCE AND ON BALL STAND-OFF VALUES FOR MORE HARMONIZED GEOMETRICAL PROPERTIES ACROSS THE SUPPLIERS.  
THE VALUES ARE: A MIN = 1.00; A MAX = 1.20; A1 MIN = 0.30; A1 MAX = 0.40.  
FOR DDR3 x32 DDP CASE, VAR.Dyy-1 MIGHT APPLY.
24. FOR x16 and x32 LPDDR2 DISCRETE AND MCP DEVICE.
25. FOR x32 2-ch LPDDR3 MCP DEVICE.

POSITIONAL TOLERANCE OVERLAY EXAMPLE  
(VARIATION CA-X EXAMPLE)



$$\begin{aligned} b' &= b \text{ max} + eee \\ D' &= D \text{ max} + ddd \\ E' &= E \text{ max} + ddd \end{aligned}$$

APPLICATION: BODY EDGES MUST LIE ON OR INSIDE  $D' \times E'$  BOUNDARY  
WHEN ALL BALLS LIE ON OR INSIDE  $\phi b'$  BOUNDARIES.

NOTE:  $D' \times E'$  IS THE MINIMUM BOARD KEEP OUT ZONE REQUIRED.



# CHANGE RECORD

IF THE CHANGE INVOLVES ANY WORDS ADDED OR DELETED (EXCLUDING DELETION OF ACCIDENTALLY REPEATED WORDS), THE CHANGE IS TO BE INCLUDED BELOW. PUNCTUATION CHANGES MAY OR MAY NOT BE INCLUDED.

INITIAL ISSUE: J	DATE: MAY 2005	JC11 ITEM NUMBER: 11.4-703
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CHANGE RECORD HISTORY:
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ISSUE: K	DATE: MAY 2005	ITEM NUMBER: 11.4-732
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LOCATION:	CHANGED FROM:	CHANGED TO:
PAGE 9	TABLE 9	TABLE 9: ADDITION OF 2 VARIATIONS DW-z AND DY-z
PAGE 17	SOLDER BALL PATTERNS	TWO NEW DRAWINGS FOR BALL LAYOUT

ISSUE: K	DATE: MAY 2005	ITEM NUMBER: 11.4-732
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LOCATION:	CHANGED FROM:	CHANGED TO:
APPLICATION NOTES	TABLE 9	ADDITION OF NOTE 22

ISSUE: L	DATE: JULY 2007	ITEM NUMBER: 11.4-775
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LOCATION:	CHANGED FROM:	CHANGED TO:
PAGE 9	TABLE 9	ADDED VARIATION DAA-z
PAGE 17	SOLDER BALL PATTERN	ADDED VARIATION DAA-z
PAGE 20	APPLICATION NOTE 22	ADDED GDDR5
PAGE 7 & 8	TABLE 6	SEVERAL SE, SD VALUES CORRECTED, PER JC11 DECISION
PAGE 11 TO 16	SOLDER BALL PATTERNS	ADDED PIN A1 MARK AND DELETED SYMBOL, PER JC11 DECISION

ISSUE: M	DATE: DEC 2010	ITEM NUMBER: 11.4-840
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LOCATION:	CHANGED FROM:	CHANGED TO:
PAGE 10	TABLE 9	ADDITION OF VARIATION DAB-z
PAGE 14	FIGURE 3, VARIATION DR-z	ADDITION OF VARIATION DAB-z
PAGE 20	APPLICATION NOTE	ADDITION OF NOTE 23

# CHANGE RECORD

IF THE CHANGE INVOLVES ANY WORDS ADDED OR DELETED (EXCLUDING DELETION OF ACCIDENTALLY REPEATED WORDS), THE CHANGE IS TO BE INCLUDED BELOW. PUNCTUATION CHANGES MAY OR MAY NOT BE INCLUDED.

INITIAL ISSUE: N	DATE: JUNE 2013	JC11 ITEM NUMBER: 11-846
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LOCATION:	CHANGED FROM:	CHANGED TO:
ALL SHEETS		NEW DRAWING FORMAT
SHEETS 3-6, TABLES	MULTIPLE DASH	SINGLE DASH
SHEET 3, TABLE 1	Ayy-z, Byy-z Cyy-z, Dyy-z	Ayy-zs, Byy-zs Cyy-zs, Dyy-zs
SHEETS 3, TABLE 1		ADDED BASIC TO VALUE
SHEET 3		ADDED EXPLANATION OF EACH LETTER IN VARIATION
SHEETS 3, TABLE 2	0.30 AT Byy-1 b1	0.25 AT Byy-1 b1
SHEET 3-6, TABLES 2-5	e	ADDED BASIC TO VALUE
SHEETS 4-6, TABLES 3-5		ADDED b1
SHEETS 7-10, TABLES 6-9		ADDED FOOTPRINT COLUMN
SHEET 8, TABLE 7		ADDED VARIATIONS BG-z, BH-z, BJ-z, BK-z
SHEET 9, TABLES 8		ADDED VARIATION CD-z
SHEET 10, TABLE 9	DW-z: D1=8.00, E1=17.60 DY-z: D1=8.00, E1=16.80	DW-z: D1=17.60, E1=8.00 DY-z: D1=16.80, E1=8.00
SHEETS 11-18	VARIATION	FOOTPRINT NUMBER ADDED NUMBER OF BALLS
SHEET 17 & 18		ADDED FOOTPRINTS 25 & 26
SHEET 19, NOTE 1	Y14.5M-1994	Y14.5-2009
SHEET 21		ADDED NOTES 24 & 25